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Potential Effects on Large Mara Construction Projects Due To Construction Delay

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Abstract

The construction industry continues to be the driving force in the growth of the nation's socio economic development. One of the major issues in large construction industry is its frequent delay where this delay decelerates the multiplier effects to the economy. This paper presents the study of a survey on significant cause of delay and its effects in large MARA (Majlis Amanah Rakyat) construction project in the views of project management consultants (PMC). Respondents of this survey were personnel that work as PMC ranging from the executives, managerial and supporting groups. The result revealed that the five most significant delay causes as seen by PMC were cash flow and financial difficulties faced by contractors, contractor's poor site management, inadequate contractor experience, shortage of site workers and ineffective planning and scheduling by contractors and its three most significant effects were time overrun, cost overrun and arbitration. Hopefully, the findings of this study will at least shade some lights to the problems faced by Malaysia construction industry particularly MARA large construction project and effort can be taken to improve it.

Keywords: construction delay, MARA construction projects, Malaysia

1. INTRODUCTION

The objective of this study is to identify the significant cause of delay and its effect in large MARA construction project from the viewpoint of Project Management Consultants (PMC). A project worth RM 5 million and above is considered as large construction project. MARA has spent approximately RM 12 billion in its development since 1st Malaysian plan [1] and a portion of this allocation was spent on construction. The major issue in MARA large construction project is the delay in completing its projects. An interview with Ir. C. A. Fauzi, Tech Art Executive Director revealed that more that 90% of large MARA construction projects experienced delay since 1984. The impact of this delay largely contributed to the deceleration of the implementation of MARA strategic planning. MARA has its own construction unit, Construction and maintenance unit (UBS) to manage the small project but engage PMC service for its large and complex construction project.

Construction delays can be defined in many ways. [2] relates construction delay to progress compared to baseline construction schedule while [3],[4] and [5] summarized that a delay is when there is time overrun or extension of time to complete the project. Generally a delay is a situation when the actual progress of a construction project is slower than the planned schedule.

The delay can be grouped into three types [6]; i. *excusable delays* (compensable and non compensable delays) where the delay is not due to contractors fault or weaknesses. For compensable delays the contractors entitle both additional time and its compensation while for non compensable delays, the contractor entitles additional time only. ii. *Non excusable delays* where the delays are due to contractors fault or weaknesses and contractors do not entitle for any compensation or additional time. iii. *Concurrent delays* where the delay involves the combination of two or more excusable delay and non excusable delay. Contractor entitles only part of the compensation and/ or additional time for the excusable delay but no compensation and/ or additional time for the non excusable delays.

For the past 15 years, extensive research works on construction delay had been carried-out throughout the world. The main cause of construction delay in high-rise building construction projects in Bangkok, Thailand are; i. shortages of construction materials, ii. shortage of site workers and iii. frequent changes by owners [7]. While a comparative study of causes of time overruns in Hong Kong construction projects revealed that five principal and common causes of delays were: i poor site management and supervision; ii unforeseen ground condition; iii low speed of decision making involving all project teams; iv) client-initiated variation and v) necessary variation of works [8]. In Saudi Arabia, 37% of constructions in public utility projects were delayed and 87% were approved extension of time. The major contributors of the delay were; i. cash flow and financial difficulties, ii. difficulties in getting work permit, iii. practice of assigning contract to lowest bidder, iv. underestimate project duration, v. effect of sub-surface condition, vi. changes in scope of projects vii. ineffective planning and scheduling by contractors, viii. shortage of manpower [9]. Contractors and consultants agreed that owner interference, inadequate contractors experience, financing and payments and labour productivity are significant factors

of construction delay of large construction project that adopted traditional contracts in Jordan [10]. Owners, contractors and consultants ranked poor contractor management, monthly payment difficulties from agencies, material procurement, poor technical performances and escalation of material prices as major factors that can cause excessive groundwater project overruns in Ghana. [11].In large construction project in Vietnam, the main cause of construction delay were; i. incompetent designers and contractors, .ii. poor estimation and change management, .iii. social and technological issues, iv. site related issues, and v. improper techniques and tools [12]. The major cause of delay in Saudi Arabia large construction projects were due to; i. change order by the owners, ii. delay in progress payment by owner's iii. ineffective planning and scheduling of project by contractor, iv. poor site management and supervision by contractor, v. shortage of labours and vi. difficulties in financing project by contractor. The surveys also concluded that 70% of projects experienced time overrun [4]. Improper site co-ordination and management of the electrical and mechanical installations, lack of timely decision making of the client, and defects identified during the fire service inspection by local authorities were the significant delay factors of fire services installation permit on time in Hong Kong [13]. In Malaysia, ten main cause of construction delays were; i. contractor's improper planning, ii. contractor's poor site management, iii. inadequate contractor experience, iv. inadequate client's finance and payments for completed work, v. problems with subcontractors, vi. shortage in material, vii. labour supply, viii. equipment availability and failure, ix. lack of communication between parties, and x. mistakes during the construction stage [14]. In residential projects construction in Jordan, the main cause of delays were financial difficulties faced by the contractors, too many change orders by the owner and poor planning and scheduling of the project by the contractors [15]. Many countries shared common cause of delay although they are not in the same region. The frequent changes by owners and inadequate client's finance and payments for completed work seems to be the most frequent major cause of delay where 5/10 researchers specify this. The shortage of site workers, ineffective planning and scheduling by contractors and contractors poor site management seem to be the 2nd most frequent major cause of delay where 4/10 researchers concluded in their study. The 3rd frequent major cause of delay from this study are cash flow and financial difficulties faced by contractors, unforeseen ground condition and low speed of decision making .The 4th frequent (2/10) major cause of delay are shortages of construction materials and inadequate contractor experience and the least frequent (1/10) major cause of delay are client-initiated variation, necessary variations of works, difficulties in getting work permit, practice of assigning contract to lowest bidder, underestimate project duration, changes in scope of projects, owner interference, labour productivity, material procurement, poor technical performances, escalation of material prices, incompetent designers and contractors, poor estimation and change management, social and technological issues, improper techniques and tools, improper site co-ordination and management of the electrical and mechanical installation, defects identified during the fire services inspection, problems

with subcontractors ,equipment availability and failure, lack of communication between parties , and mistakes during the construction stage. Countries such as Saudi Arabia, Jordan, Ghana and Malaysia seem to share some common major cause of delay although they are not in the same region. The most significant issue faced by these countries is cash flow and financial difficulties faced either by the owners or contractors. Some of the major cause of delays is unique where it is applicable to a particular project or country only.

Not many researchers studied on the effect of the delay. [16] listed 6 effects of delay; time overrun, cost overrun, dispute, arbitration litigation and total abandonment. [14] used the findings by [16] in their study on cause and effects in Malaysia construction industry. [17] recommended that the schedule to be used as contract document for identification of potential delay situations to reduce the incidence of disputes and claims. [18] concluded that a fair and effective evaluation of delay impact is possible if the most appropriate delay analysis method is selected. Delay and cost overrun is common in construction projects in Ghana [12]. *Time overrun* seems to be the most frequent effects of construction where [8],[11],[12],[14] and [16] concluded this. The next most frequent is cost overrun as what has been identified by [12],[14] and [16]. It seems that disputes, arbitration, litigation and total abandonment were the least frequent effects of construction delay. Countries such as Hong Kong, Ghana, Vietnam, Nigeria and Malaysia seem to share the common effect of construction delay, i.e time overrun.

2. METHODOLOGY

A survey questionnaire was developed to determine the perception of PMC on the significant cause of delay and its effects in large MARA construction projects. The questionnaire was divided into 3 parts;

i. Demography,
   This part contains questions on background information of respondents such as gender, age, highest education, occupational level, years of working experience, field of specialization, and largest project involved based on contract sum

ii. Significant cause of delay,
   This part contains 18 well recognized significant causes of delay identified through previous study. At the end of the questionnaire, there is an open ended question for any added information.

iii. The effect of delay.
   This part contains 6 effects of construction delay identified by [17]. Also at the end of this part, there is an open ended question for the added information.

A five point likert-scale of 1 to 5 was adopted to assess the degree of agreement of each cause and effects where 1 represented 'strongly disagree', 2 'disagree', 3 'moderately agree', 4 'agree' and 5 'strongly agree'. Sensitive issues such as political and religious issues were omitted to avoid the prejudice response. Before distributing the questionnaire, the questionnaire was tested for its validity and sufficiency. The validity was tested by referring to 3 experts [a MARA director, a consultant engineer, a

CIDB state director] who are familiar and have more than 20 years experience with Malaysia construction industry or used to work on MARA projects. The sufficiency test was carried out through pilot study.

A 'convenience sampling' was used in this study where twelve current large MARA construction project scattered throughout peninsular Malaysia was selected as the case study. The author visited the site and distributed the questionnaire to the PMC by hand (face to face method) and self collect it. Some of the questionnaire was sent by email, mail and through third party to other respondents that were not at the site and followed up by phone. Discussion also had been carried out at the site to clarify some issues and giving more freedom for the respondents to air their views. Altogether from 45 questionnaires distributed, 37 responded (82.2%). Responses to the questionnaire were analyzed by using SPSS software.

The data were tested for its reliability and level of agreement of the ranked scores.

3. DATA ANALYSIS

The validity test shows that the experts agreed that all questions in the questionnaire were relevant and enough for this study and also there were no duplicated question. The pilot study shows that all respondents agreed that the questionnaire is sufficient to determine the significant cause of construction delay and its effect. In the data reliability test, Cronbach's Alpha value was 0.618 (>0.6) which shows that the data were acceptable [19]. The value of The Kendall's Coefficient of concordance was 0.364 (> 0.0) which shows that the level of agreement of the ranked scores is quite high [20]. The demography of the respondents is shown in Table 1.

Table 1: Demography of respondents

Gender	%
Male	100
Female	0.00
Age[years]	%
20-29	2.70
30-39	43.24
40-49	37.84
>50	16.22
Highest education	%
Secondary[form 1-5]	18.92
Pre-U[form 6 or equivalent]	21.62
University[dip-degree]	59.46
Post graduate[master-phd]	0.00
Occupational level	
Executive	2.70
Managerial	43.24
Support	54.05
Working experience[years]	
< 2	0.00
2-5	0.00
6-10	18.92
>10	81.08
Field of specialization	
building	67.57
mechanical	5.41
electrical	8.11
infrastructure	5.41
others	13.51
Largest project involved based on contract sum[mil RM]	
< 1	0.00
1-10	0.00
10-50	13.51
> 50	86.49

The 5 most significant cause of construction delay as perceived by PMC were; i. Cash flow and financial difficulties faced by contractors (13.8), ii. Contractor's poor site management (12.74), iii. Inadequate contractor experience (12.61), iv. Shortage of site workers (12.36) and v. Ineffective planning and scheduling by contractors (12.18). The 3 most significant effects were time overrun (4.71), cost overrun (4.43) and arbitration (3.39).
The detail analysis are shown in Table 2 and Table 3.

Table 2: The ranking of significant cause of delay

Significant cause of delay	Mean Rank	Rank
Cash flow and financial difficulties faced by contractors	13.80	1
Contractor's poor site management	12.74	2
Inadequate contractor experience	12.61	3
Shortage of site workers	12.36	4
Ineffective planning and scheduling by contractors	12.18	5
Escalation of material prices	11.27	6
Practice of assigning contract to lowest bidder	11.01	7
Problems with subcontractors	10.47	8
Lack of communication among parties	10.32	9
Change management	9.69	10
Late in material procurement	9.66	11
Incompetent designers	9.46	12
Poor estimate project duration	8.07	13
Low speed of decision making	6.11	14
Unforeseen ground condition	6.00	15
Changes in scope of projects during construction work	5.93	16
Frequent design changes	5.00	17
Owner interference in construction work/process	4.31	18

Table 3: The ranking of effects of delay

Effects	Mean Rank	Rank
Time overrun	4.71	1
Cost overrun	4.43	2
Arbitration	3.39	3
Total abandonment	3.07	4
Disputes	2.90	5
Litigation	2.50	6

4. DISCUSSION OF RESULTS

4.1 Significant cause of delay

The PMC believes that the significant causes of construction delays were contractor-related. The top five causes were non-excusable delay where the contractors were the responsible party.

i. Cash flow and financial difficulties faced by contractors.
   Cash flow and financial difficulties faced by contractor is one of the most significant cause of delay as what has been found by [4],[10] and [15]. In this study, most of the contractors do not have sound financial standing or backing. They take short cut by outsourcing (sub-contracting) most of the works. When they have difficulties in paying the sub-contractor, the works become slower and sometimes stopped. It is interesting to investigate this 'phenomena' further because the contractors are having this problem despite they are eligible to take advance up to 25% of the contract sum before work started.

ii. Contractor's poor site management
   [4],[9],[12] and [14] also found that

the contractor's poor site management is another significant delay contributor. The smooth management at the site plays important role for the successful of the project. The failure in managing and attending the daily routine and problems at the project site contribute to the delay significantly. The incompetent of site managers come with minimum support from the top management making the matter worst. There were cases where the site manager quits for other better job and the post were vacant for sometime resulting in poor site management and eventually delay in work progress. When a new and inexperienced project manager is hired, he/she takes sometime to adapt to new environment and this significantly contribute to the delay.

iii. Inadequate contractor experience
An adequate contractor experience is very crucial in executing work efficiently and forecasting the potential problems that may arise during construction work. As a cost cutting measure, many contractors prefer to hire the young and inexperience staff especially technical staffs as these junior staffs accept less pay. This inexperience staffs has limited ability and need more guidance in carrying out the job. They have difficulties in their daily routine job and frequently fail to forecast the potential problems that they might be facing during construction work and this can lead to shoddy work quality and extension of time.

iv. Shortage of site workers
Workers continue to be the most important party in construction work. The speed of work depends largely to the efficiency and availability of workers. Most of contractors are using sub-contractors to do the construction work and when the delay in payment to the sub-contractors, the sub-contractors have limited resource to work with and subsequently reduce the number of workers or stop work until they get payment from the contractors. Although there are abundant of workers especially foreign workers in this sector, the reluctant of the contractors or sub-contractors to hire more workers contribute to shortage of site workers and eventually delay the projects.

v. Ineffective planning and scheduling by contractors
Planning and scheduling is one of the cores of construction management. This planning and scheduling table is drawn by contractors as guidelines during construction. The inability of contractors to follow the planning and scheduling effectively largely due to financial problem, poor site management, inexperience staff and shortage of workers at the site keep the project dragging. The monthly site meeting fails to resolve these issues as everybody is pointing fingers at each other.

4.2 Effects of delay

i. Time overruns
Time overruns has become the major effect of construction delay. This time overruns can be due to excusable

delay or non-excusable delay. From the analysis of the cause of delay, the contractors contributed to the five most significant cause of delay where all of the causes were non-excusable delay. This time overrun has the multiplying effects where MARA has to reprogram its strategic planning. According to MARA progress report on 30/6/08, 41 % of the current projects delayed for more than 300 days. This is very crucial to MARA where they have to delay in many of its training activities for quite sometime resulting potential trainers lost the opportunities to be trained.

ii. Cost overruns
Cost overrun can be due to changes in scope of projects during construction work or frequent design changes by owners. In most cases, time overrun leads to cost overrun. The longer the extension of time, the more cost involve such as payment for salaries, utility bills, the fluctuation of material prices and etc. to be borne resulting in more cost overruns. The situation will become worst when the contractors were terminated; new contractors were hired with significant increase in prices.

iii. Arbitration
When a contract is terminated, the amount of work completed by contractors is evaluated. The quantum to be paid to contractors depends largely to reports and recommendations from PMC, QS and other consultants. An arbitrator is appointed to act as a middle man to settle any disputes amicably so that it will not lead to court case.

5. CONCLUSION

Since PMC is one of the most important parties in its construction projects, the findings of this study are significant enough for MARA to take note. It is concluded that the five most significant cause of construction delay as seen by PMC are; cash flow and financial difficulties faced by contractors, contractor's poor site management, inadequate contractor experience, shortage of site workers and ineffective planning and scheduling by contractors. The existence of the effects of the delay will only surface if there are delays and it is extremely important for MARA to tackle the delay problems earlier in order to reduce or avoid it.

The top-5 significant cause of delay is related to contractors' weaknesses. It is also non-excusable delay where the contractors have to take full responsibility for the delay. Since contractor-related problems were the main contributor to the delay, it is recommended that;

For future project, MARA must pay special attention to the selection criteria of contractors. A more stringent guideline should be introduced in selecting the contractors. The contractor must reveal its current financial standing during the bidding process such as bank statement account, letter of financial backing from financial institution or other backing financial facilities. The contractor must also furnish the list and the background of its management and technical teams. The background should include the qualification and experience. The bidding contractor should be requested to list down its skill workers together with their specialization. A good track record shows effective planning and scheduling, therefore a potential

contractor must also show its track record during the bidding process and MARA should consider this track record seriously when making decision. This information about the contractors are very critical in helping MARA in making decision to select the reliable contractors for its construction project and eventually avoid or reduce the delay in its future projects. With no delay or reduce delay, the effect can be eliminated or reduced.

For current project, since most of the delays were non-excusable delay and contractor-related, it is very important for MARA to be firm and fast action in dealing with the contractors. The delay in action taken to the responsible parties may lead to delay.

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